UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/765,948	01/29/2004	Azat M. Latypov	1857.2190000	1856

26111 7590 03/17/2009

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
1100 NEW YORK AVENUE, N.W.
WASHINGTON, DC 20005

EXAMINER	
RASHID, DAVID	

ART UNIT	PAPER NUMBER
2624	

MAIL DATE	DELIVERY MODE
03/17/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/765,948	LATYPOV ET AL.	
	Examiner	Art Unit	
	DAVID P. RASHID	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 December 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3,5-7,9,10,13,15 and 18-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3,5-7,9,10,13,15 and 18-24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Table of Contents

Amendments & Claim Status

[1] This office action is responsive to the Amendment and Reply Under 37. C.F.R. § 1.111 received on Dec. 18, 2008. Claims 1, 3, 5-7, 9-10, 13, 15, and 18-24 remain pending; 2 cancelled.

Response to Arguments

[2] Applicant's Remarks filed Dec. 18, 2008 with respect to claims 1, 3, 5-7, 9-10, 13, 15, and 18-24 have been respectfully and fully considered, but are not found persuasive.

Summary of Remarks regarding Claims 1 and 24 Rejections under 35. U.S.C. § 103

> The Examiner, in rejecting the above-noted features on page 5 of the Office Action, relies upon elements 402, 404 (in Figure 4), elements 608, I1, I2 (in Figure 6), col. 3, lines 31-34, and col. 13, lines 20-34 of Sandstrom. Applicants respectfully disagree with the Examiner's statements of rejection.
>
> In the above-identified figures and corresponding text, Sandstrom at most discloses a technique to block light reflected from a non-deflected micromirror from reaching a substrate using aperture 402. Aperture 402 is not used to independently resolve individual pixels. In addition, Sandstrom is silent with respect to such blocking by aperture 402 being used for calibrating the individual pixels based upon a result signal associated with each independently resolved pixel. Instead, Sandstrom relies upon "a *previously empirically calibrated* linearization function" for individual pixel correction. *(See,* Sandstrom at col. 13, line 23, cited by the Examiner, emphasis added). Therefore, Sandstrom does not disclose at least the above-noted features of claim 1.

Remarks at 8.

However, "independently resolving individual pixels among the plurality of pixels using the apodized pupil" is anticipated in both fig. 4 and fig. 6 of *Sandstrom*. "[I]ndependently resolving individual pixels among the plurality of pixels" occurs for every single middle pixel as shown in fig. 4 (and occurs for all pixels individually). Individual pixels are resolved as shown in fig. 2 (depicting individual pixels each undergoing a separate transformation) among a plurality of pixels, and the resolving occurs for each pixel independent from the other pixels (i.e., each pixel is individually and thus independently transformed). Furthermore, the independent resolving occurs "using the apodized pupil" because the apodized pupil exists between the pixels and substrate as shown in fig. 4 and fig. 6. The calibration of the pixels is affected by the existence of the apodized pupil (the apodized pupil affecting the result signals), and thus the apodized pupil has been used. This is evident because the existence and size of the apodized pupil "determines the numerical aperture (NA) of the system and thereby the minimum pattern feature size that can be written on the substrate." *Sandstrom* at 12:5-8. "In particular the synchronised variation of the illumination and a pupil filter can give an increased resolution, most notably if the pupil has and a sector-shaped transmitting area and the illumination is aligned so that the non-diffracted light intercepts an absorbing stop near the apex of the sector." *Sandstrom* at 11:1-6. In effect, the existence and size of the pupil does determine characteristics of which is recorded, and thus is "used" in that sense.

The Examiner suggests further limiting the claim element such that "use" of the apodized pupil is more restrictive other than its "existence" in affecting the result signals for calibration purposes (e.g., what is the apodized pupil exactly doing, a more descriptive "usage" of it other than its existence that effects result signals).

Furthermore, *Sandstrom* discloses at least those features in claim 26. Remarks at 9 (arguing claim 24 containing similar distinguishing features as receptively recited in claim 1). As argued above *Sandstrom* does disclose the claim element of "independently resolving individual pixels among the plurality of pixels using the apodized pupil". *Yamamoto* need not resolve any deficiency of *Sandstrom*. Remarks at 8-9 (arguing there exists deficiencies such that *Yamamoto* fails to resolve).

Summary of Remarks regarding Claims 10 and 18 Rejections under 35. U.S.C. § 103

> However, Evans does not solve for the deficiencies of Sandstrom and Yamamoto as argued above with respect to claims 1 and 24, nor is Evans being used by the Examiner to resolve those deficiencies of Sandstrom and Yamamoto.

Remarks at 10.

However, as argued above *Sandstrom* does disclose the claim element of "independently resolving individual pixels among the plurality of pixels using the apodized pupil". *Yamamoto* need not resolve any deficiency of *Sandstrom*.

Summary of Remarks regarding Claims 22 and 23 Rejections under 35. U.S.C. § 103

> However, Pederson does not solve for the deficiencies of Sandstrom and Yamamoto as argued above with respect to claims 1 and 24, nor is Evans being used by the Examiner to resolve those deficiencies of Sandstrom and Yamamoto.

Remarks at 10.

However, as argued above *Sandstrom* does disclose the claim element of "independently resolving individual pixels among the plurality of pixels using the apodized pupil". *Yamamoto* need not resolve any deficiency of *Sandstrom*.

Claim Rejections - 35 U.S.C. § 112

[3] The following is a quotation of the second paragraph of 35 U.S.C. § 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Indefinite Limitations

Claims 1, 3, 5-7, 9-10, 13, 15, and **18-24** are rejected under 35 U.S.C. § 112, second paragraph for containing indefinite limitations in using the phrase "substantially" (e.g., claim 1, line 3) as it is unclear what definite degree is considered substantial. Claim 24 is rejected by analogy. Claims 2-3, 5-7, 9-10, 13, 15, and 18-23 are rejected by dependency.

Claim Rejections - 35 U.S.C. § 103

[4] The following is a quotation of 35 U.S.C. § 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Sandstrom in view of Yamamoto et al.

Claims 1-3, 5-7, 9, 13, 15, 19-21 and **24** are rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,399,261 (issued Jun. 4, 2002, hereinafter "Sandstrom") in view of U.S. Patent No. 5,610,897 (issued Mar. 11, 1997, hereinafter "Yamamoto et al.").

Regarding **claim 1**, while *Sandstrom* discloses a method (2:27-53) comprising:

applying individual voltages (5:12-13; 13:30-35) having respective voltage values (any applied voltage has a "voltage value") substantially simultaneously to each of a plurality of pixels (fig. 2; fig. 3; fig. 4) in a spatial light modulator (SLM) (fig. 4; 2:66-67; fig. 6, item 601) to move at least one individual pixel (e.g., the moving pixel at fig. 4) from the plurality of pixels (fig. 3);

reflecting light from the at least one moved individual pixel (e.g., the moving pixel at fig. 4);

passing the reflected light (12:15-17) from the at least one individual pixel through an apodized pupil (fig. 4, items 402, 404; fig. 6, items 608, I_1, I_2) in an optical system (fig. 6, item 604);

capturing an image of the at least one individual pixel (e.g., the moving pixel at fig. 4) from the reflected light after it passes through the apodized pupil ("CCD camera" at 13:3-7);

independently resolving individual pixels (e.g., the moving pixel at fig. 4) among the plurality of pixels (fig. 3) using the apodized pupil (fig. 4, items 402, 404; fig. 6, items 608, I_1, I_2);

correlating the image of the individually resolved pixels and the respective voltage values to generate respective result signals ("...series of test patterns..." at 13:27-31); and

calibrating the individually resolved pixels including the at least one individual pixel ("empirical calibration procedure. . .and the resulting exposed patterns are measured and used for individual pixel correction" at 13:29-31 (emphasis added)) using the respective result signals (13:20-34), *Sandstrom* does not teach using a semi-plane knife-edge to block from one side a zero order lobe of a pixel diffraction pattern associated with the individual pixel at the apodized

pupil (though *Sandstrom* suggests there exists a lobe (whether main or side is not specified) that is blocked from a pixel diffraction pattern at the apodized pupil).

Yamamoto et al. teaches using a semi-plane knife-edge (fig. 21, item 119) to block, from only one side at a time, a zero order lobe (it is inherent by fig. 21 that the semi-plane knife-edge removes all light passing through the side of the semi-plane knife-edge and thus deleting all light on that side of which would have been collected at item 120, including a zero order lobe on that side) of a diffraction pattern (e.g., fig. 45 list "diffraction patterns").

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the apodized pupil of *Sandstrom* to include blocking a portion of a zero order lobe of a pixel diffraction pattern as taught by *Yamamoto et al.* AND thus (i) the diffraction pattern of *Yamamoto et al.* would then be the pixel diffraction pattern of *Sandstrom*; and (ii) the semi-plane knife-edge to block of *Yamamoto et al.* would then be "associated with the individual pixel at the apodized pupil" (whether close or far is irrelevant if the knife-edge is already being used to block a zero order lobe) of *Sandstrom* "to provide an optical information recording/reproduction apparatus, which allows reproduction of an information pit smaller than a light spot, and can remarkably increase the storage capacity of an information storage medium applied to this reproduction" (*Yamamoto et al.* at 2:6-11) and for "[g]enerating a focusing error signal for auto-focusing control" (*Yamamoto et al.* at 28:2-3).

Regarding **claim 3**, *Sandstrom* further comprises using a charge coupled device (CCD) to perform the capturing step ("CCD camera" at 13:3-7).

Regarding **claim 5**, *Sandstrom* discloses wherein the image of each of the pixels is captured using more than one cell in the CCD array (It is implicit if not already inherent that the image of each of the pixels is captured using more than one cell in the CCD array.).

Regarding **claim 6**, *Sandstrom* further comprises:

tilting the at least one individual pixel (e.g., the moving pixel at fig. 4) through a plurality of desired angles (7:36-38); and

performing the capturing step for each of the desired angles (those angles desired from the possible "25 levels (plus zero)" to perform the calibration as outlined in 13:20-34 are performed).

Regarding **claim 7**, *Sandstrom* further comprises:

tilting the at least one individual pixel (e.g., the moving pixel at fig. 4) through a plurality a set of angles (7:36-38); and

performing the capturing step for each angle in the set of angle (those angles in the set from the possible "25 levels (plus zero)" to perform the calibration as outlined in 13:20-34 are performed)

using interpolation to determine a voltage value that moves the at least one individual pixel (e.g., the moving pixel at fig. 4) to an angle outside the set of angles ("interpolating" at 7:36-38).

Regarding **claim 9**, *Sandstrom* further comprises forming the apodized pupil using one of an annular (fig. 6, item 608) and a semi-circular pattern

Regarding **claim 13**, claim 3 recites identical features as in claim 13. Thus, references/arguments equivalent to those presented for claim 3 are equally applicable to claim 13.

Regarding **claim 15**, claim 5 recites identical features as in claim 15. Thus, references/arguments equivalent to those presented for claim 5 are equally applicable to claim 15.

Regarding **claim 19**, *Sandstrom* further comprises wherein:

the voltage moves each of the individual pixels (e.g., the moving pixel at fig. 4; fig. 3) through a plurality of desired angles (the desired angles of fig. 4; 5:8-20); and

the correlating device (the device responsible for 13:27-31) determined a second result signal for each of the desired angles.

Regarding **claim 20**, claims 7 and 19 recite identical features as in claim 20. Thus, references/arguments equivalent to those presented for claims 7 and 19 are equally applicable to claim 20.

Regarding **claim 21**, *Sandstrom* further comprises using projection optics of a lithography tool ("The present invention relates to printing of patterns…" at 1:10-12) as the optical system (fig. 6, item 604).

Regarding **claim 24**, while *Sandstrom* discloses a system (2:27-53) comprising:

a voltage value storage (5:12-13; 13:30-35) configured to substantially simultaneously transmit individual voltages having voltage values (any applied voltage has a "voltage value") to

corresponding individual pixels (e.g., the moving pixel at fig. 4) in a spatial light modulator (SLM) (fig. 4; 2:66-67; fig. 6, item 601) to move the individual pixels (e.g., the moving pixel at fig. 4);

a device (fig. 4A, items 402, 404) configured to apodize a pupil (fig. 6, item 608) in an optical system;

a detector ("CCD camera" at 13:3-7) configured to capture an image corresponding to each of the individual pixels (e.g., the moving pixel at fig. 4) from light that has reflected off the SLM (fig. 4A, item 401) and passed through the device;

a correlating device (the device responsible for 13:27-31) configured to correlate the image and the voltage values to generate a first result signal ("…series of test patterns…" at 13:27-31), respectively for each of the individual pixels (e.g., the moving pixel at fig. 4), for independently resolving each of the individual pixels (e.g., the moving pixel at fig. 4) substantially simultaneously; and

a controller configured to calibrate the resolved individual pixels (e.g., the moving pixel at fig. 4; "empirical calibration procedure. . .and the resulting exposed patterns are measured and used for individual pixel correction" at 13:29-31 (emphasis added)) using the result signal (13:20-34), *Sandstrom* does not teach using a semi-plane knife-edge to block from one side a zero order lobe of a pixel diffraction pattern associated with the individual pixel at the apodized pupil (though *Sandstrom* suggests there exists a lobe (whether main or side is not specified) that is blocked from a pixel diffraction pattern at the apodized pupil).

Yamamoto et al. teaches using a semi-plane knife-edge (fig. 21, item 119) to block, from only one side at a time, a zero order lobe (it is inherent by fig. 21 that the semi-plane knife-edge removes all light passing through the side of the semi-plane knife-edge and thus deleting all light on that side of which would have been collected at item 120, including a zero order lobe on that side) of a diffraction pattern (e.g., fig. 45 list "diffraction patterns").

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the apodized pupil of *Sandstrom* to include blocking a portion of a zero order lobe of a pixel diffraction pattern as taught by *Yamamoto et al.* AND thus (i) the diffraction pattern of *Yamamoto et al.* would then be the pixel diffraction pattern of *Sandstrom* and (ii) the semi-plane knife-edge to block of *Yamamoto et al.* would then be "associated with each of the individual

pixels at the apodized pupil" (whether close or far is irrelevant if the knife-edge is already being used to block a zero order lobe) of *Sandstrom* "to provide an optical information recording/reproduction apparatus, which allows reproduction of an information pit smaller than a light spot, and can remarkably increase the storage capacity of an information storage medium applied to this reproduction" (*Yamamoto et al.* at 2:6-11) and for "[g]enerating a focusing error signal for auto-focusing control" (*Yamamoto et al.* at 28:2-3).

Sandstrom in view of Yamamoto et al. and Evans et al.

[5] **Claims 10** and **18** are rejected under 35 U.S.C. § 103(a) as being unpatentable over *Sandstrom* in view of *Yamamoto et al.* and U.S. Patent No. 5,965,330 (issued Oct. 12, 1999; hereinafter "Evans et al.").

Regarding **claim 10**, while *Sandstrom* in view of *Yamamoto et al.* discloses the method of claim 1, *Sandstrom* in view of *Yamamoto et al.* does not teach further comprising forming the apodized pupil using one of a semi-plane, a shearing grating, and an algorithm derived apodization pattern, such that variations are present in at least one of transmittance and phase.

Evans et al. discloses a method for fabricating annular mask lens having diffraction-reducing edges (fig. 13) that teaches forms an apodized pupil using one of an algorithm derived apodization pattern (13:33-56), such that variations are present in at least one of transmittance (13:33-56) and phase.

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the annular apodized pupil of *Sandstrom* in view of *Yamamoto et al.* to include forming the annular apodized pupil using an algorithm derived apodization pattern, such that variations are present in at least one of transmittance and phase as taught by *Evans et al.* because "[t]he improved mask eliminates the "halo effect" associated with conventional annular masks. . ." (*Evans et al.*, 2:25-30).

Regarding **claim 18**, claim 10 recites identical features as in claim 18. Thus, references/arguments equivalent to those presented for claim 10 are equally applicable to claim 18.

Sandstrom in view of Yamamoto et al. and Pederson

[6] **Claims 22-23** are rejected under 35 U.S.C. § 103(a) as being unpatentable over *Sandstrom* in view of *Yamamoto et al.* and U.S. Patent No. 6,369,879 (issued Apr. 9, 2002, hereinafter "Pedersen").

Regarding **claim 22**, while *Sandstrom* in view of *Yamamoto et al.* disclose the method of claim 1, *Sandstrom* in view of *Yamamoto et al.* do not teach wherein the image of each of the plurality of pixels is captured using one cell in a CCD array.

Pedersen discloses a method for determining the coordinates of an object (fig. 2) that include wherein the image (fig. 2, item 16) of each of the plurality of pixels ("one to one" at 4, line 59-5, line 8) is captured using one cell in the CCD array (fig. 2, item 26).

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the CCD array and image of each of the plurality of pixels of *Sandstrom* in view of *Yamamoto et al.* to include wherein the image of each of the pixels is captured using one cell in the CCD array as taught by *Pedersen* so that "each LCD pixel is uniquely identified with a number", (*Pedersen* at 5:9-10) and in "detecting at known detector pixel locations the intensity sequence of reflected illumination from the surface of the object whereby the identity and location of the originating illuminated pixel can be determined" (*Pedersen* at 2:59-62).

Regarding **claim 23**, claim 22 recites identical features as in claim 23. Thus, references/arguments equivalent to those presented for claim 22 are equally applicable to claim 23.

Conclusion

[7] Any inquiry concerning this communication or earlier communications from the examiner should be directed to DAVID P. RASHID whose telephone number is (571)270-1578 and fax number (571)270-2578. The examiner can normally be reached Monday - Friday 7:30 - 17:00 ET.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bhavesh Mehta can be reached on (571) 272-7453. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications

may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/David P. Rashid/
Examiner, Art Unit 2624

/Bhavesh M Mehta/
Supervisory Patent Examiner, Art Unit 2624

David P Rashid
Examiner
Art Unit 26244